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# PATENT ABSTRACTS OF JAPAN

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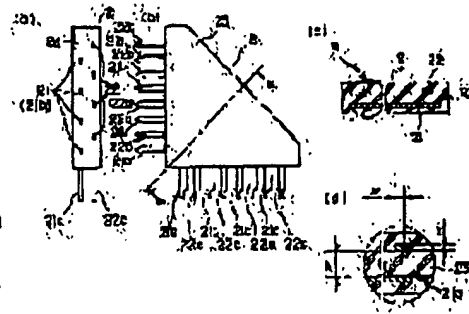
(72)Inventor : SAITO KAZUKI

(54) CONNECTOR SUITABLE FOR FAST TRANSMISSION

**(57)Abstract:**

**PROBLEM TO BE SOLVED:** To provide a connector which is suitable for fast transmission, easily capable of easily matching impedance by integrating a grounding contact and a signal contact and including a resin which is a derivative constituting a micro-strip line structure.

**SOLUTION:** When a contact assembly 2 is manufactured, a plurality of signal contacts 22 are opposite to each other with given gap against a ground contact 21, and link parts 21a and 22a of the ground and signal contacts 21 and 22 are entered in a die. Thereafter, a synthetic resin is implanted in this die, and thereby the ground contact 21 and a plurality of signal contacts 22 are integrated with each other by the synthetic resin. After mold-in molding, a carrier is cut. Thereby, the ground contact 21 and the signal contact 22 are integrated by the synthetic resin. In addition, there is provided a contact assembly 2 with a micro-strip line structure, in which the synthetic resin of the derivative is interposed between the ground contact 21 and the signal contact 22.



## LEGAL STATUS

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**CLAIMS**

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[Claim(s)]

[Claim 1] A connector suitable for high-speed transmission characterized by including resin which is the dielectric which unites with said grand contact and said signal contact, and constitutes microstrip line structure while intervening between grand contact, signal contact which opens a gap and counters to this grand contact, and said said signal contact in grand contact.

[Claim 2] A connector suitable for high-speed transmission characterized by to include resin which is the dielectric which intervenes between a pair of grand contact which opens a gap and counters mutually, signal contact arranged between these a pair of grand contacts, and said said signal contact in a pair of grand contact, and which both unites with said a pair of grand contact and said signal contact, and constitutes stripline structure.

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**DETAILED DESCRIPTION**

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**[Detailed Description of the Invention]**

[0001]

[The technical field to which invention belongs] This invention belongs to the connector which has the structure suitable for high-speed transmission.

[0002]

[Description of the Prior Art] As this conventional kind of a connector, there are some which are indicated by JP,3-233879,A and JP,4-181668,A.

[0003] In these conventional examples, mold Inn shaping of grand contact and the signal contact is carried out separately, it changes so that these casts may be combined with housing, and it aims at impedance matching and reduction of a cross talk.

[0004]

[Problem(s) to be Solved by the Invention] however — a microstrip line and a stripline — a signal, although the conductor and the gland are unified with the dielectric (resin) As mentioned above, since it acts to resin as mold Inn of signal contact and the grand contact separately and became another components in the conventional connector, Namely, since signal contact and grand contact are not unified with a dielectric, In case it grows neither into microstrip line structure nor stripline structure, therefore impedance matching is carried out, the approximation calculation equation of a microstrip line or a stripline cannot be used. For this reason, in a Prior art, there was a trouble that impedance matching could not be performed experimentally and experientially and impedance matching could not be performed easily.

[0005] So, the technical problem of this invention is to offer the connector suitable for the high-speed transmission which can perform impedance matching simply using the approximation calculation equation of a microstrip line or a stripline.

[0006]

[Means for Solving the Problem] While intervening between grand contact, signal contact which opens a gap and counters to this grand contact, and said said signal contact in grand contact according to invention according to claim 1, a connector suitable for high-speed transmission characterized by including resin which is the dielectric which unites with said grand contact and said signal contact, and constitutes microstrip line structure is obtained.

[0007] The connector suitable for the high-speed transmission characterized by to be included the resin which is the dielectric which intervenes between a pair of grand contact which opens a gap and counters mutually, signal contact arranged between these grand contacts of a pair of, and said signal contact of said in a pair of grand contact, and which both unites with said grand contact of a pair of and said signal contact, and constitutes stripline structure according to invention according to claim 2 is obtained.

[0008]

[Embodiment of the Invention] Drawing 1 shows the contact assembly of the connector for high-speed transmission by the gestalt of operation of the 1st of this invention (edge connector). The cross section in the A-A line by which front view and (b) are shown in a side elevation, and (a) shows (c) to (b), (d) is an enlarged view of the B section shown in (c), and drawing 2 shows contact of the contact assembly shown in drawing 1. The side elevation of the condition before (a) carries out mold Inn shaping of the signal contact, (b) is the side

elevation of the condition before carrying out mold Inn shaping of the grand contact. Drawing 3 shows housing for combining two or more contact assemblies shown in drawing 1. (a) shows the condition that front view (b) is a side elevation and drawing 4 mounted the connector for high-speed transmission by the 1st operation gestalt in the substrate, and its (a) is a cross section in the C-C line which shows rear view and (b) in a side elevation, and shows (c) to (a). With reference to drawing 1 thru/or drawing 4, the connector 1 for high-speed transmission of this operation gestalt consists of the housing 3 for combining two or more contact assemblies 2 and the contact assembly 2 of these plurality.

[0009] Each contact assembly 2 consists of the grand contact 21, two or more signal contacts 22, and the synthetic resin 23 that is a dielectric. The grand contact 21 has abbreviation triangle-like Division for Interlibrary Services 21a, contact section 21b of the shape of two or more pin formed successively by one side of this Division for Interlibrary Services 21a in the predetermined pitch, and two or more terminal area 21c formed successively in the predetermined pitch the other sides of Division for Interlibrary Services 21a. The grand contact 21 is formed of press working of sheet metal, etching processing, etc. Each signal contact 22 consists of Division for Interlibrary Services 22a, contact section 22b of the shape of a pin formed in the end of this Division for Interlibrary Services 22a, and terminal area 22c formed in the other end of connection section 22a. This signal contact 22 is also formed of press working of sheet metal, etching processing, etc. The signal contact 22 of this plurality (in the case of this operation gestalt 4) In the condition before mold Inn shaping, it is unified by carrier 22d and sets in this condition. The pitch of contact section 22b of the signal contact 22, and terminal area 22c It is equal to the pitch of contact section 21b of the grand contact similarly connected with carrier 21d, and terminal area 21c, and when carrier 21d and 22d are piled up, it has shifted by the half-pitch.

[0010] In manufacture of the contact assembly 2, are in the condition shown in drawing 2, open a predetermined gap to the grand contact 21, and two or more signal contacts 22 are made to counter, it is in this condition, the Division for Interlibrary Services 21a and 22a of the grand contact 21 and the signal contact 22 is put in in a mold, synthetic resin is poured in into this mold after that, and this unifies the grand contact 21 and two or more signal contacts 22 with synthetic resin. Carriers 21d and 22d are cut after this mold Inn shaping. The contact assembly 2 of microstrip line structure with which the grand contact 21 and the signal contact 22 were unified with synthetic resin, and the synthetic resin which is a dielectric intervened between the signal contacts 22 in the grand contact 21 by this is obtained.

[0011] The impedance Z of the contact assembly 2 of this microstrip line structure is called for by the several 1 following equation (approximation calculation equation).

[0012]

[Equation 1]

$$Z = \frac{87}{\sqrt{\epsilon r + 1.41}} \times \ln \left( \frac{5.98 h}{0.8 w + t} \right)$$

Here, it is the distance (gap between grand contacts in signal contact) of h: signal pattern and a grand side.

t: Thickness of a signal pattern (thickness of the Division for Interlibrary Services of signal contact)

w: Width of face of a signal pattern (width of face of the Division for Interlibrary Services of signal contact)

epsilon r: It is the specific inductive capacity of synthetic resin.

[0013] Two or more contact assemblies 2 constituted as mentioned above are together put with the housing 3 shown in drawing 3. This housing 3 has the alignment hole 31 for aligning these while making the contact sections 21b and 22b of the contact assembly 2 insert in. Moreover, housing 3 has the fixed part 32 by which screw hole 32a was formed in the flank. By pressing the contact sections 21b and 22b of each contact assembly 2 fit in the alignment hole 31 of this housing 3, two or more contact assemblies 2 are fixed to housing 3, and,

thereby, the connector 1 for high-speed transmission of this operation gestalt is constituted.  
 [0014] After inserting the terminal areas 21c and 22c of a connector 1 in the through hole 51 formed in the card 5 on the occasion of mounting, a connector 1 is fixed on a card 5 with the screw 6 inserted in screw hole 32a of a fixed part 32, and it changes further so that terminal areas 21c and 22c may be soldered to the through hole 51 of a card 5.

[0015] Drawing 5 shows the contact assembly of the connector for high-speed transmission by the 2nd operation gestalt of this invention, and the cross section in D-D line front view and (b) are indicated in a side elevation, and (a) indicates (c) to be to (b), and (d) are enlarged views of the E section shown in (c). With reference to drawing 5, since this operation gestalt is the 1st operation gestalt and \*\*\*\* configuration, the reference number same about the same component as the 1st operation gestalt as the 1st operation gestalt is attached, the explanation is omitted, and a mainly different portion from the 1st operation gestalt is explained.

[0016] With this operation gestalt, the portion of the Division for Interlibrary Services 21a and 22a of the grand contact 21 and the signal contact 22 is put in in a mold, synthetic-resin 23' which is adhesives is poured in into this mold, by this synthetic-resin 23', the grand contact 21 and the signal contact 22 were unified, and the contact assembly 2 of microstrip line structure has been obtained. In addition, it is made to have not covered the surroundings of the signal contact 22 with this operation gestalt.

[0017] Also in this operation gestalt, the connector is constituted by combining two or more contact assemblies 2 with housing like the 1st operation gestalt.

[0018] Drawing 6 shows the contact assembly of the connector for high-speed transmission by the 3rd operation gestalt of this invention, and the cross section in the F-F line by which front view and (b) are shown in a side elevation, and (a) shows (c) to (b), and (d) are enlarged views of the G section shown in (c). With reference to drawing 6, since this operation gestalt is the 1st operation gestalt and \*\*\*\* configuration, the reference number same about the same component as the 1st operation gestalt as the 1st operation gestalt is attached, the explanation is omitted, and a mainly different portion from the 1st operation gestalt is explained.

[0019] This operation gestalt changes with stripline structure, and is the first difference from the 1st operation gestalt of which this point consists with microstrip line structure. Therefore, the contact assembly 2 of this operation gestalt consists of the synthetic resin 23 which is the dielectric which unites with a pair of grand contact 21 both with which it intervenes between a pair of grand contact 21 which opens a gap and counters mutually, the signal contact 22 arranged between this the grand contact 21 of a pair of, and the signal contact 22 in a pair of grand contact 21, and the signal contact 22, and constitutes stripline structure.

[0020] The configuration of the grand contact 21 and the signal contact 22 is the same as that of the 1st operation gestalt. Moreover, the process of the contact assembly 2 of this operation gestalt is the same as that of the 1st operation gestalt. Furthermore, also in this operation gestalt, the connector is constituted by combining two or more contact assemblies 2 with housing. The impedance Z of the contact assembly 2 of the stripline structure of this operation gestalt is called for by the several 2 following equations (approximation calculation equation).

[0021]

[Equation 2]

$$Z = \frac{60}{\sqrt{\epsilon r}} \ln \left( \frac{4b}{0.67\pi w (0.8 + t/w)} \right)$$

Here, it is the distance (gap of grand contact and grand contact) of a b: grand side and a grand side.

h: Distance of a signal pattern and a grand side (gap between grand contacts in signal contact)

t: Thickness of a signal pattern (thickness of the Division for Interlibrary Services of signal contact)



w: Width of face of a signal pattern (width of face of the Division for Interlibrary Services of signal contact)

epsilon<sub>r</sub>: It is the specific inductive capacity of synthetic resin.

[0022] In addition, although the above-mentioned 1st thru/or the 3rd operation gestalt are edge connectors, of course, this invention is applicable to the connectors, for example, the connector for substrates etc., other than this etc.

[0023] Moreover, although the connector 1 for high-speed transmission by the above-mentioned 1st thru/or the 3rd operation gestalt consists of two or more contact assemblies 2 and the housing 3 which unifies these. Of course, since all the functions of a connector can be demonstrated not only with this but with one contact assembly, even when a connector can also be constituted from one contact assembly and it combines two or more contact assemblies theoretically, housing is not necessarily required.

[0024] Moreover, with the above-mentioned 1st thru/or the 3rd operation gestalt, as the contact sections 21b and 22b, although the pin-like thing is used, the thing of the shape not only of this but a socket, a fork-like thing, etc. may be used.

[0025] Moreover, although it changes with the above-mentioned 1st thru/or the 3rd operation gestalt so that soldering of the terminal area of a contact assembly may be carried out to the through hole of a card, you may make it connect with a substrate, a card, etc. by SMT or press fit.

[0026] Moreover, things other than several 1 equation are also known, for example, the approximation calculation equation which asks for the impedance in a microstrip line has the several 3 following equations.

[0027]

[Equation 3]

$$Z_0 = 80 \ln \left( \frac{8h}{w} + \frac{w}{4h} \right) \dots \frac{w}{h} \leq 1$$

$$Z_0 = \frac{120 \pi}{\frac{w}{h} + 2.42 - 0.44 \frac{h}{w} + \left( 1 - \frac{h}{w} \right)^6} \dots \frac{w}{h} \geq 1$$

$$\epsilon_{\text{eff}} = \frac{\epsilon_r + 1}{2} + \frac{\epsilon_r - 1}{2} \left( 1 + \frac{10h}{w} \right)^{-1/2}$$

$$Z_0 = (\epsilon_{\text{eff}})^{1/2} \cdot Z$$

Here, it is the Z: impedance Z<sub>0</sub>. : Distance w of a vacuum impedance h: signal pattern and a gland: Width-of-face epsilon<sub>eff</sub> of a signal pattern : Effective dielectric-constant epsilon<sub>r</sub>: It is a non-dielectric constant.

[0028] Similarly, as for the approximation calculation equation which asks for the impedance in a stripline, things other than several 2 equations are also known.

[0029]

[Effect of the Invention] In case the connector suitable for the high-speed transmission of this invention performs impedance matching, the approximation calculation equation of a microstrip line or a stripline can be used for it. Therefore, according to the connector suitable for the high-speed transmission of this invention, impedance matching can be performed easily.

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**DESCRIPTION OF DRAWINGS**

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**[Brief Description of the Drawings]**

[Drawing 1] The contact assembly of the connector for high-speed transmission by the 1st operation of this invention is shown, and the cross section in the A-A line by which front view and (b) are shown in a side elevation, and (a) shows (c) to (b), and (d) are enlarged views of the B section shown in (c).

[Drawing 2] Contact of the contact assembly shown in drawing 1 is shown, and the side elevation of the condition before (a) carries out mold Inn shaping of the signal contact, and (b) are the side elevations of the condition before carrying out mold Inn shaping of the grand contact.

[Drawing 3] Housing for combining two or more contact assemblies shown in drawing 1 is shown, and front view (b) of (a) is a side elevation.

[Drawing 4] The condition of having mounted the connector for high-speed transmission by the 1st operation gestalt in the substrate is shown, and (a) is a cross section in the C-C line which shows rear view and (b) in a side elevation, and shows (c) to (a).

[Drawing 5] The contact assembly of the connector for high-speed transmission by the 2nd operation gestalt of this invention is shown, and the cross section in D-D line front view and (b) are indicated in a side elevation, and (a) indicates (c) to be to (b), and (d) are enlarged views of the E section shown in (c).

[Drawing 6] The contact assembly of the connector for high-speed transmission by the 3rd operation gestalt of this invention is shown, and the cross section in the F-F line by which front view and (b) are shown in a side elevation, and (a) shows (c) to (b), and (d) are enlarged views of the G section shown in (c).

**[Description of Notations]**

1 Connector for High-speed Transmission

2 Contact Assembly

21 Grand Contact

21a Division for Interlibrary Services

21b Contact section

21c Terminal area

21d Carrier

22 Signal Contact

22a Division for Interlibrary Services

22b Contact section

22c Terminal area

22d Carrier

23 Synthetic Resin

3 Housing

31 Alignment Hole

32 Fixed Part

32a Screw hole

5 Card

51 Through Hole

6 Screw

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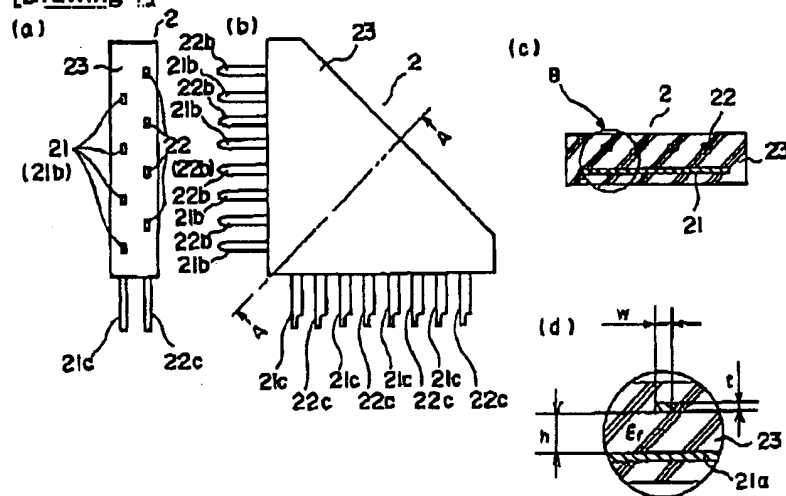
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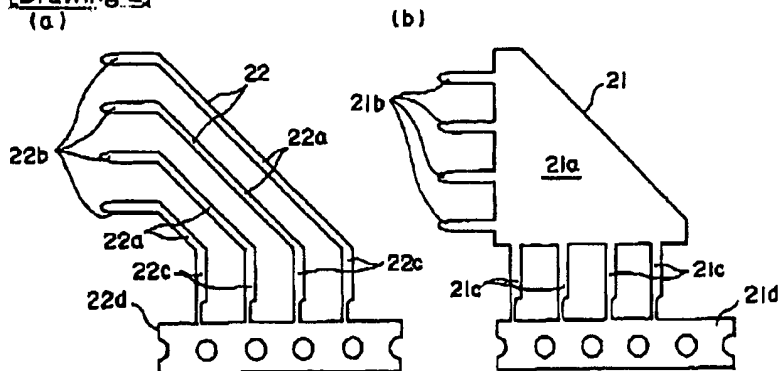
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**DRAWINGS**

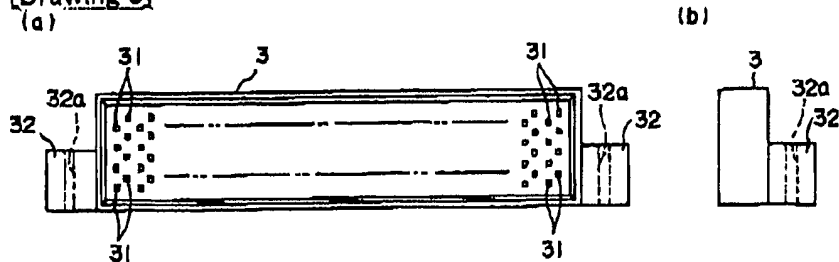
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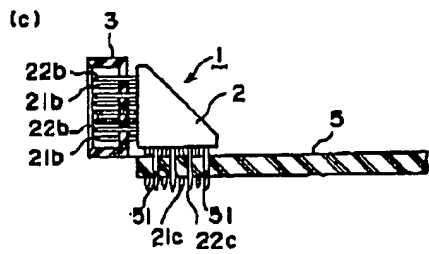
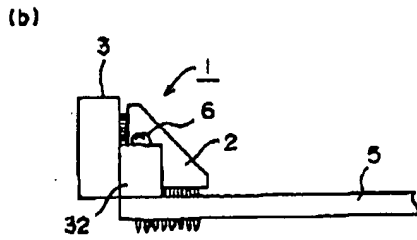
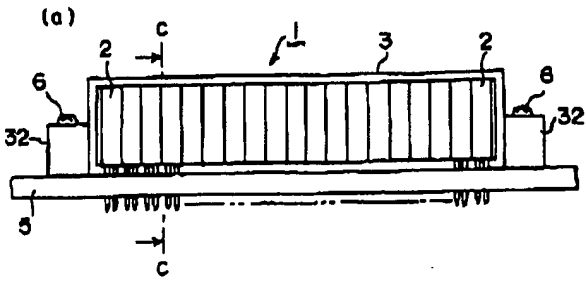
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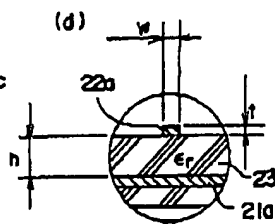
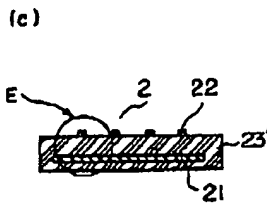
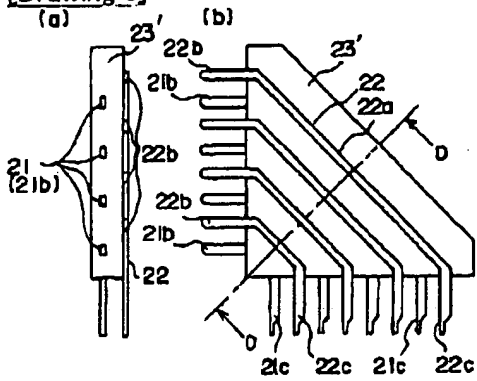
**[Drawing 3]**



**[Drawing 4]**



[Drawing 5]



[Drawing 6]

